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From eFish to RecFish - Progress towards Developing an App that Engages Recreational Anglers as Community Scientists

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From eFish to RecFish

Photo: Travis Long

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A final report to:
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From eFish to RecFish

PROGRESS TOWARDS DEVELOPING AN APP THAT ENGAGES RECREATIONAL ANGLERS AS COMMUNITY SCIENTISTS

Award Information

Project Title:	Recreational Anglers + eBird + FishVerify = eFish
Principal Investigator:	Lisa Kellogg
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Abstract

The success of the Cornell Lab of Ornithology with eBird and its associated apps demonstrates the potential value in engaging recreational enthusiasts as community scientists through the use of a cell phone application (hereafter “app”). However, significant differences exist between the recreational angler community and the birding community making it necessary to further investigate the feasibility of engaging recreational anglers as community scientists using an app. The funds awarded through the VIMS Dean and Director’s Innovation Fund were used to: 1) assess the existing landscape of for-profit fishing apps and not-for-profit efforts to use recreational anglers as community scientists, 2) explore current app technologies for potential inclusion in a recreational fishing app, 3) explore potential external funding sources, and 4) determine a preliminary feature set for inclusion in an app for recreational anglers.

Rationale

Like birders, recreational anglers are inclined to conserve the finfish species they value. By developing high-quality, user-friendly apps and by understanding the incentive structure required to engage and retain birders as community scientists, eBird has become one of the world’s most successful community science projects, building a community of hundreds of thousands of users who contribute more than 250,000 bird observations per day. A similar approach could potentially be used to engage recreational anglers as community scientists. The Chesapeake Bay region is an ideal testbed for this type of project because of the high population of recreational anglers,

the existing interest of both recreational anglers and management agencies in using recreational anglers as community scientists, and the concentration of fisheries scientists and fisheries resource managers in the region.

Project Narrative

The goal of this project was to determine whether development of a recreational fishing app (hereafter "RecFish") to engage recreational anglers as community scientists was feasible and, if so, develop a vision for what that app would include. Towards this end, the following objectives were identified and achieved. Note that between the original Innovation Fund award and this report, the decision was made to change the name of the proposed app from eFish to RecFish due to issues acquiring relevant domain names for eFish.

Objective 1: Assess the existing landscape of for-profit fishing apps and not-for-profit efforts to use recreational anglers as community scientists

Results: The concept of an app for recreational anglers is not new. A wide variety of free and paid apps already exist. To assess the extent to which these apps overlap with the project goals, a survey of existing apps was conducted to assess app features, pricing and popularity. By far, the app with the most users is FishBrain which advertises itself as a "social fishing for anglers". This app focuses on recording catches, sharing photos of catches, and providing fishing forecasts. Although the app developers claim to have over 10 million users, relatively few of the users reporting their catches are fishing in the Chesapeake Bay region. Other for-profit apps focus on providing expert fishing advice and fishing forecasts. The only for-profit fish identification app found during the survey that uses machine learning for fish species identification is limited to species found in Florida. The survey we conducted suggests that no existing for-profit fishing app has significant penetration into the recreational angler community in Chesapeake Bay.

Several non-for-profit efforts exist with the goal of collecting data from recreational anglers. Many of these are focused on a very limited number of species and/or seek to answer a very specific research question. Some of these provide services such as catch logging but often require sharing of all data recorded. Some require tedious entry of substantial amounts of information prior to recording the catch. Conversations with the groups who developed some of these apps suggest that adoption rates are low and that a significant amount personnel time has been expended to gain each user (e.g. three in-person contacts per user). Notably, one of these groups will be spending the next year focusing solely on how to acquire and retain users.

Conclusions: There is ample room in the existing for-profit and non-for-profit landscape for a recreational angler app that focuses on providing valuable services to recreational anglers in return for data on their catch. In developing RecFish, significant

effort should be focused on creating a user interface that is easy to use, provides useful services, and is highly engaging. Without high adaption and retention rates, RecFish will collect little data.

Objective 2: Explore current app technologies for potential inclusion in a recreational fishing app

Results: The first step in collecting data from recreational anglers is accurate identification of the fish caught. Last year in Chesapeake Bay, the iAngler app was used as part of a fishing tournament sponsored by the Chesapeake Bay Foundation. The goal of the tournament was to catch as many different species of fish as possible over restored oyster reefs. This required accurate identification of every fish caught. Discussions about that tournament with one of the staff members involved revealed that many anglers were unable to accurately identify all of the species of fish they caught.

The original plan for RecFish was to take an approach similar to the Cornell Lab of Ornithology's Merlin Bird ID app which uses date, location, and responses to a few simple questions to narrow down the species to a few possibilities and then provides photos and other information to assist the user in selecting the appropriate species. After reviewing the Wisconsin Fish app which uses this approach and several similar apps, we decided that this was unlikely to be the best approach for fish identification and began exploring the possibility of using artificial intelligence, specifically machine learning models, for automated fish identification. Significant advances in machine learning have been made in recent years, making it feasible to develop apps that accurately classify objects based on data input from the camera on a mobile device. TensorFlow, developed by Google, is an open source platform for machine learning that is commonly used for image classification. It provides a wealth of free online resources (e.g. pre-trained models and datasets, libraries, tools and extensions) that help developers build, train and deploy machine learning powered applications across a variety of platforms. Other groups (e.g. FishBrain) are already working to use this technology for fish identification but are having difficulty training their models for anything but common fish species because large numbers of accurately identified images are required. This impediment is one that VIMS is uniquely suited to overcome.

Conclusions: Accurate fish identification using a machine learning model is feasible and preferable to using an identification system based on fish characters. It has the added benefit of being faster than a character-based system and the novelty of the technology is likely to help engage users.

Objective 3: Explore additional funding sources

Results: Developing and supporting RecFish will be an expensive endeavor. Although we hope that RecFish will eventually become self-sustaining, initial support will need to come from a wide variety of sources. To support the continued development of RecFish, a proposal was submitted to the National Fish and Wildlife Foundation's

Electronic Monitoring and Reporting Grant Program in collaboration with Innovation Fund committee member Rob Quartel. That proposal was successful in acquiring an additional $43,375. In collaboration with Eric Hilton of VIMS, another proposal was submitted to the VIMS Dean and Director's Innovation Fund to begin development of the machine learning model that will be fundamental to providing accurate fish identification in the RecFish app. This proposal was also successful and was awarded $43,000. Funding will again be sought this year from the National Fish and Wildlife Foundation's Electronic Monitoring and Reporting Grant Program as well as a variety of other sources.

Conclusions: Our 100% success rate in acquiring funding for RecFish is encouraging. The conversations we have had with various resource managers, funding agencies and non-profits have also been very encouraging. All have been enthusiastic about the project and have been instrumental in providing connections and introductions to others they think would be interested in the project. We are hopeful that these connections are the first step towards building a support group that will ultimately help us acquire the needed funds to develop and maintain RecFish.

Objective 4: Determine preliminary feature set for inclusion in an app for recreational anglers

Results: Through our survey of existing apps, conversations with recreational anglers, and conversations with others who have developed apps for recreational anglers, we have identified a set of key features that we plan to provide as a part of the RecFish app (Fig. 1). They include: 1) accurate fish identification based on a machine learning model, 2) fish length based either on Google's ARCore technology or reference to an object of know size (e.g. a coin), 3) approximate fish weight based on fish length, 4) information on whether it is legal to keep the fish based on local fishery regulations, 5) information on edibility of catch, 6) an option to take a photo of the fish stamped with information on fish species, length and weight, 7) an option to log the catch including fish characteristics, location, time and date of catch, 8) a link to additional information about the species, and 9) a link that allows instant upload of data to the cloud or delayed upload if cell service is unavailable. All of these features will be provided in an intuitive, icon-based format that can easily be read on a vessel at sea.

Conclusions: Based upon all of our work and conversations with other groups, we believe that the RecFish app has the potential to become a powerful tool for engaging recreational anglers as community scientists. Our next steps towards RecFish development include: 1) development of a proof-of-concept machine learning model capable of identifying a limited number of Chesapeake Bay species, 2) continued discussions with the growing network of people interested in RecFish including resource managers, NGOs, recreational angler groups and individual anglers, and 3) expansion of our network to include experts in gamification to help us better understand options for increasing angler adoption and continued use of the app.

Figure 1. Mockup of RecFish app with descriptions of information provided by the app to the angler.